

reports a whole gale from sw. to nw.; lowest barometer, 29.45 (748.0), at 8 p. m. of the 31st, in N. 49° 27', W. 22° 13'.

Capt. W. Willegerod, of the s. s. "Trave," had a strong westerly gale on the 31st; lowest barometer, 29.57 (751.0), at 4 a. m., in N. 49° 34', W. 24° 0'. Capt. C. W. Kennedy, of the s. s. "Germanic," reports a strong gale on the 30th and 31st; lowest barometer, 29.29 (744.0), at 10.30 a. m. of the 31st, in N. 51° 32', W. 21° 30'. Chief Officer Miller, of the s. s. "Scandinavian," Capt. John Park, commanding, reports a strong gale from s. veering to nne. and backing to w. on the 31st; lowest barometer, 29.22 (742.2), at noon, in N. 54° 21', W. 18° 1'.

OCEAN ICE.

On chart i are also exhibited the eastern and southern limits of the region within which icebergs and field ice have been reported during October, 1886. These limits have been determined from reports furnished by shipmasters, and from trustworthy data published in the "New York Maritime Register" and other newspapers.

During this month the easternmost ice was encountered on the 28th, in N. 46° 03', W. 46° 37', by the s. s. "Etruria," and the southernmost ice reported was observed on the 5th, in N. 41° 34', W. 49° 43', by the s. s. "Borderer."

The icebergs reported were, in each instance, isolated, and, while they were encountered within a considerable area, the aggregate number observed was small, although in excess of the average for the month as determined from reports for the three preceding years.

A comparison with the chart for the preceding month (September, 1886), shows the number of icebergs observed to be about the same, although the area covered by ice reported during that month was much smaller, the southern limit being five degrees further north and the eastern limit about two degrees further west.

The following table shows the comparison between October, 1886, and the three preceding years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Lon. W.	Month.	Lat. N.	Lon. W.
October, 1883	46 56	46 22	October, 1883	46 56	46 22
October, 1884	near Cape Race		October, 1884	46 56	50 55
October, 1885	48 21	47 12	October, 1885	48 21	47 12
October, 1886	41 34	49 43	October, 1886	46 03	46 37

Icebergs were reported during the month, as follows:

1st.—The bark "Fluorine," at 7 p. m., passed an iceberg in N. 50° 48', W. 49° 30'.

3d.—The s. s. "Buenos Ayrean," in N. 52° 26', W. 52° 20', at noon, observed a large iceberg, sse., fifteen miles.

5th.—The s. s. "Borderer," at 8.30 a. m., in N. 43° 39', W. 49° 7', passed to the south of a large iceberg about three hundred feet high; also passed a large iceberg in N. 41° 34', W. 49° 43', which affected the temperature of the water twelve degrees at a distance of ten miles.

16th.—The s. s. "Hibernian," at 1.45 p. m. (Greenwich mean time), in N. 48° 18', W. 48° 57', passed an iceberg of moderate size.

17th.—The s. s. "Toronto," at 8.20 p. m., in N. 52° 30', W. 52° 0', passed an iceberg.

18th.—The s. s. "Toronto," at 6 a. m., in N. 51° 53', W. 55° 2', passed an iceberg.

20th.—The s. s. "Edam," in N. 47° 51', W. 47° 0', passed a large iceberg about one hundred and twenty feet high and twelve hundred feet long.

27th.—The s. s. "Egypt," at 2.30 p. m., in N. 46° 20', W. 47° 2', passed an iceberg.

28th.—The s. s. "Etruria," at noon, in N. 46° 03', W. 46° 37', passed an iceberg with two peaks about one hundred and fifty feet high.

FOG.

The following table shows the limits of fog-areas encountered

on the north Atlantic Ocean during October, 1886, as reported by shipmasters:

Dates.	Vessel.	Entered.		Cleared.	
		Lat. N.	Lon. W.	Lat. N.	Lon. W.
October 17th	S. S. "Venetian"	49 24	38 30		
October 17-18th	S. S. "Bothnia"	49 58	31 50	49 25	39 4
October 24th	S. S. "Galileo"	48 28	35 4	seven hours.	
October 28th	S. S. "Istrian"	42 29	56 9	at Boston.	
October 30th	S. S. "Galileo"	42 27	66 10	fourteen hours.	

In above instances fog was encountered with south to east winds.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to shipmasters.

In pursuance of the arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during October, 1886, four reports concerning storms and icebergs encountered by vessels in the Atlantic west of the forty-fifth meridian. One message was sent from Boston.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada for October, 1886, is exhibited on chart ii by the dotted isothermal lines; and in the table of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service. On chart iv the departures from the normal temperature are illustrated by lines connecting stations of normal or equal abnormal values.

In the following table are given the mean temperatures for the several geographical districts, with the normals and departures, as deduced from Signal Service observations:

Average temperatures for October.			
Districts.	Average for October, Signal Service observations.		Comparison of Oct., 1886, with the average for several years.
	For several years.	For 1886.	
New England	52.6	52.1	- 0.5
Middle Atlantic States	57.8	58.1	+ 0.3
South Atlantic States	65.8	64.4	- 1.4
Florida Peninsula	74.1	72.8	- 1.3
Eastern Gulf States	66.7	65.6	- 1.1
Western Gulf States	67.4	65.9	- 1.5
Rio Grande Valley	74.6	73.5	- 1.1
Tennessee	60.8	59.5	- 1.3
Ohio Valley	56.8	56.5	- 0.3
Lower Lake region	52.2	52.6	+ 0.4
Upper Lake region	47.6	50.9	+ 3.3
Extreme Northwest	42.4	46.6	+ 4.2
Upper Mississippi Valley	53.7	57.1	+ 3.4
Missouri Valley	50.8	56.0	+ 5.2
Northern slope	44.2	47.1	+ 2.9
Middle slope	51.6	55.2	+ 3.6
Southern slope	61.5	63.0	+ 1.5
Southern plateau	59.1	58.2	- 0.9
Middle plateau	49.7	48.0	- 1.7
North Pacific coast region	57.1	50.2	- 6.9
Middle Pacific coast region	61.0	58.3	- 2.7
South Pacific coast region	66.0	62.1	- 3.9

The mean temperature of the month is decidedly above the normal in the upper lake region, upper Mississippi valley, Missouri Valley, extreme northwest, and in eastern Montana; within these districts the departures are large, averaging 4° 5 and ranging from 6° 4, at Yankton, Dakota, to 2° 9, at Alpena, Michigan. In the south Atlantic and Gulf states the month is slightly cooler than the average October, the departures range from 0° 6, at Charleston, South Carolina, to 2° 9, at Chattanooga, Tennessee, and average 1° 3 below the normal.

On the Pacific slope, also, the temperature of the month is below the normal, slightly in the northern portion, and considerably in California. In New England, the Ohio Valley, and the Rocky Mountain region, the temperature is normal, or nearly so.

The following are some of the most marked departures from the normal temperature at Signal Service stations:

Above normal.		Below normal.	
Yankton, Dakota.....	6.4	Yuma, Arizona.....	4.9
Moorhead, Minnesota.....	6.2	Sacramento, California.....	3.7
Saint Vincent, Minnesota.....	6.0	Los Angeles, California.....	3.5
Saint Paul, Minnesota.....	6.0	San Diego, California.....	3.1
Omaha, Nebraska.....	5.7	Chattanooga, Tennessee.....	2.9
La Crosse, Wisconsin.....	4.7	Cedar Keys, Florida.....	2.8
Marquette, Michigan.....	4.7	Little Rock, Arkansas.....	2.7
North Platte, Nebraska.....	4.7	Palestine, Texas.....	2.5
Huron, Dakota.....	4.6	Red Bluff, California.....	2.2

Table of comparative maximum and minimum temperatures for October.

State or Territory.	Station.	For 1886.		Since establishment of station.			
		Max.	Min.	Max.	Year.	Min.	Year.
Alabama.....	Mobile.....	88.8	37.1	93.4	1884	34.0	1873
Do.....	Montgomery.....	88.1	37.1	96.1	1884	33.0	1873
Arizona.....	Prescott.....	77.2	26.1	86.0	1877, 1881	18.0	1880
Do.....	Fort Apache.....	79.7	27.8	86.9	1885	19.0	1880
Arkansas.....	Fort Smith.....	82.9	31.0	94.7	1883	18.0	1873
Do.....	Little Rock.....	82.3	33.1	91.0	1881	38.8	1885
California.....	San Francisco.....	78.9	46.0	84.0	1871	45.0	1881
Do.....	San Diego.....	75.0	46.6	92.0	1879	44.0	1879
Colorado.....	Denver.....	77.0	22.6	86.0	1873	1.0	1873
Do.....	Pike's Peak.....	57.3	3.6	47.0	1879	17.0	1878
Connecticut.....	New Haven.....	78.4	25.1	86.0	1881	24.0	1879
Do.....	New London.....	76.0	29.9	82.7	1879	27.2	1883
Dakota.....	Fort Buford.....	85.0	22.3	95.0	1879	9.0	1881
Do.....	Yankton.....	82.6	19.9	89.0	1879	9.0	1878
Delaware.....	Del. Breakwater.....	82.6	19.9	84.0	1881	34.5	1884
Do.....	Cape Henlopen.....	76.6	45.6				
District of Columbia.....	Washington City.....	83.2	33.3	92.3	1881	26.0	1873
Florida.....	Jacksonville.....	87.3	44.0	92.0	1883	40.0	1873
Do.....	Key West.....	90.7	67.9	92.0	1876	65.0	1873, 1876
Georgia.....	Atlanta.....	83.9	34.2	90.8	1884	33.6	1884
Do.....	Savannah.....	83.3	41.8	92.0	1884	37.0	1873
Idaho.....	Boise City.....	82.6	32.0	88.0	1879, 1880	19.0	1878
Illinois.....	Chicago.....	79.4	32.1	84.0	1879	24.0	1873
Do.....	Indianapolis.....	82.3	31.7	87.0	1884	23.0	1878
Indiana.....	Fort Sill.....	83.0	35.2	91.0	1878	25.0	1878
Indian Territory.....	Dubuque.....	85.2	26.5	86.0	1879	20.0	1873
Iowa.....	Keokuk.....	81.1	33.3	87.0	1879	20.0	1873
Do.....	Dodge City.....	86.4	28.3	90.0	1883	10.0	1878
Kansas.....	Leavenworth.....	86.0	26.8	89.0	1871, 1874	19.0	1873
Do.....	Louisville.....	83.4	30.3	90.0	1884	27.0	1878
Kentucky.....	New Orleans.....	87.4	45.3	90.8	1884	40.0	1873
Louisiana.....	Shreveport.....	84.4	39.4	95.0	1883	31.0	1873
Do.....	Eustis.....	80.0		80.0	1879	24.0	1881
Maine.....	Portland.....	78.5	27.6	83.0	1879, 1881	28.0	1876, 1879
Do.....	Baltimore.....	82.3	36.4	89.0	1879, 1881	30.0	73, '76, '79
Maryland.....	Boston.....	79.7	27.2	90.0	1881	25.0	1879
Massachusetts.....	Detroit.....	77.0	35.7	85.0	1879, 1884	22.0	1873
Michigan.....	Alpena.....	78.3	29.0	84.0	1884	20.1	1885
Minnesota.....	Duluth.....	80.2	27.2	78.0	1879	8.0	1878
Do.....	Saint Paul.....	82.0	20.9	87.0	1879	15.0	1878
Mississippi.....	Vicksburg.....	85.0	36.3	93.7	1884	34.0	1873
Missouri.....	Saint Louis.....	82.7	35.0	90.0	1879	25.0	1873
Montana.....	Fort Benton.....			87.0	1881	6.0	1875
Do.....	Helena.....	73.5	23.5	76.9	1885	10.0	1882
Nebraska.....	North Platte.....	77.3	25.6	89.0	1879	11.0	1878
Do.....	Omaha.....	85.2	15.9	87.0	1879	15.0	1878
Nevada.....	Winnemucca.....	76.7	16.7	84.0	1879	10.0	1873
New Hampshire.....	Mount Washington.....	48.8	-0.8	59.0	1871	3.0	1881
Do.....	Atlantic City.....	73.9	36.2	83.0	1881, 1884	29.0	1879
Do.....	Sandy Hook.....	79.0	38.0	84.0	1879	33.0	1876
New Mexico.....	Santa Fe.....	69.0	30.0	85.0	1878	10.0	1880
Do.....	Buffalo.....	71.2	33.9	83.6	1879	24.7	1884
New York.....	New York City.....	82.5	34.6	84.5	1884	31.0	1876
Do.....	Charlotte.....	84.5	36.6	91.9	1884	30.0	1879
North Carolina.....	Wilmington.....	87.1	38.4	92.5	1884	32.0	1876
Do.....	Cincinnati.....	83.4	32.5	87.7	1884	27.0	1873
Ohio.....	Cleveland.....	80.6	35.1	87.0	1879	26.0	1876
Do.....	Portland.....	75.0	33.9	82.2	1885	31.0	1877
Oregon.....	Roseburg.....	82.0	32.7	90.9	1885	22.5	1881
Pennsylvania.....	Pittsburgh.....	79.2	35.5	91.1	1884	28.0	73, '76, '78
Do.....	Philadelphia.....	83.7	36.8	87.0	1879, 1881	31.0	1873, 1876
Rhode Island.....	Block Island.....	71.0	35.1	75.4	1881	35.0	1880
South Carolina.....	Charleston.....	86.1	44.9	93.0	1883	39.0	1873
Tennessee.....	Knoxville.....	83.0	32.0	94.0	1884	25.0	1876
Do.....	Nashville.....	84.1	33.2	91.9	1884	28.0	1876
Texas.....	Fort Davis.....	83.2	43.0	90.0	1881	30.0	1880
Do.....	Galveston.....	83.4	50.2	87.2	1884	45.0	1873
Utah.....	Salt Lake City.....	77.3	28.6	83.0	1876	22.0	1878
Virginia.....	Lynchburg.....	85.5	33.7	91.3	1884	28.0	1879
Do.....	Norfolk.....	80.6	44.3	89.0	1881, 1884	31.0	1876
Washington Ter.....	Spokane Falls.....			75.5	1885	18.0	1881
Do.....	Olympia.....	66.2	34.0	73.0	1880	23.0	1881
Wisconsin.....	La Crosse.....	81.0	26.6	84.0	1879, 1884	18.0	1873
Do.....	Milwaukee.....	82.3	31.3	83.1	1884	22.0	1878
Wyoming.....	Cheyenne.....			80.0	73, '74, '79	4.0	1878

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures for October for a series of years, the mean temperature for October, 1886, and the departures from the normal:

Station.	County.	Normal temperature for October.	Number of years.	Mean temperature for Oct., 1886.	Departure.
Arkansas.		61.9	5	58.3	-3.6
Lead Hill.....	Boone.....	61.9	5	58.3	-3.6
California.		60.6	20	54.8	-5.8
Sacramento.....	Sacramento.....	60.6	20	54.8	-5.8
Connecticut.		50.5	28	50.4	-0.1
Middletown.....	Middlesex.....	50.5	28	50.4	-0.1
New Haven.....	New Haven.....	51.4	100	52.8	+1.4
Thompson.....	Windham.....	50.1	30	50.8	+0.7
Dakota.		49.8	4	51.1	+1.3
Webster.....	Day.....	49.8	4	51.1	+1.3
Florida.		73.0	4	72.7	-0.3
Archer.....	Alachua.....	73.0	4	72.7	-0.3
Illinois.		60.2	11	61.1	+0.9
Anna.....	Union.....	60.2	11	61.1	+0.9
Collinsville.....	Madison.....	55.6	6	58.1	+2.5
Mattoon.....	Coles.....	55.0	6	60.0	+5.0
Peoria.....	Peoria.....	54.0	30	58.4	+4.4
Riley.....	McHenry.....	47.7	26	52.2	+4.5
Sandwich.....	De Kalb.....	51.2	35	54.5	+3.3
Sycamore.....	De Kalb.....	50.9	6	50.6	-0.3
Indiana.		53.1	7	53.5	+0.4
Lafayette.....	Tippecanoe.....	53.1	7	53.5	+0.4
Logansport.....	Cass.....	53.2	31	50.2	-3.0
Vevay.....	Switzerland.....	56.2	21	56.6	+0.4
Iowa.		46.6	10	51.8	+5.2
Cresco.....	Howard.....	46.6	10	51.8	+5.2
Monticello.....	Jones.....	49.8	33	53.0	+3.2
Kansas.		58.8	15	59.8	+1.0
Independence.....	Montgomery.....	58.8	15	59.8	+1.0
Wellington.....	Sumner.....	56.5	8	56.8	+0.3
Maine.		47.1	27	47.7	+0.6
Belfast.....	Waldo.....	47.1	27	47.7	+0.6
Bridgeton.....	Cumberland.....	47.6	12	47.8	+0.2
Cornish.....	York.....	46.7	29	46.7	0.0
Orono.....	Penobscot.....	46.2	18	45.5	-0.7
Maryland.		55.4	16	56.2	+0.8
Fallston.....	Harford.....	55.4	16	56.2	+0.8
Massachusetts.		48.8	52	49.7	+0.9
Amherst.....	Hampshire.....	48.8	52	49.7	+0.9
Cambridge.....	Middlesex.....	50.4	64	50.2	-0.2
Fitchburg.....	Worcester.....	48.4	30	48.3	-0.1
Lowell.....	Middlesex.....	50.7	15	50.0	-0.7
New Bedford.....	Bristol.....	52.1	75	51.8	-0.3
Somerset.....	Bristol.....	53.3	16	52.9	-0.4
Springfield.....	Hampden.....	51.2	19	52.0	+0.8
Taunton.....	Bristol.....	53.9	16	51.1	-2.8
Williamstown.....	Berkshire.....	46.8	31	49.3	+2.5
Nevada.		47.5	7	46.2	-1.3
Carson City.....	Ormsby.....	47.5	7	46.2	-1.3
New Brunswick.		45.9	26	45.6	-0.3
Saint John.....	Saint John.....	45.9	26	45.6	-0.3
New Hampshire.		50.7	19	49.8	-0.9
Concord.....	Merrimac.....	46.1	28	46.4	+0.3
Hanover.....	Grafton.....	46.1	28	46.4	+0.3
New Jersey.		53.6	17	54.3	+0.7
South Orange.....	Essex.....	53.6	17	54.3	+0.7
New York.		49.0	19	49.8	+0.8
North Valley.....	Oswego.....	49.0	19	49.8	+0.8
Palermo.....	Oswego.....	45.7	33	47.4	+1.7
Ohio.		51.2	16	52.0	+0.8
Wauseon.....	Fulton.....	51.2	16	52.0	+0.8
Westerville.....	Franklin.....	51.7	12	51.4	-0.3
Pennsylvania.		47.0	19	49.0	+2.0
Dyberry.....	Wayne.....	47.0	19	49.0	+2.0
South Carolina.		65.3	6	63.0	-2.3
Stateburg.....	Sumter.....	65.3	6	63.0	-2.3
Texas.		69.9	15	69.1	-0.8
New Ulm.....	Austin.....	69.9	15	69.1	-0.8
Vermont.		44.7	38	49.2	+4.5
Lunenburg.....	Essex.....	44.7	38	49.2	+4.5
Newport.....	Orleans.....	46.3	11	46.3	0.0
Stratford.....	Orange.....	47.5	12	49.0	+1.5
Virginia.		61.8	18	53.9	-7.9
Bird's Nest.....	Northampton.....	61.8	18	53.9	-7.9
Dale Enterprise.....	Rockingham.....	59.0	6	61.3	+2.3
Variety Mills.....	Nelson.....	57.6	9	52.8	-4.8
Wytheville.....	Wythe.....	53.7	22	52.9	-0.8
West Virginia.		52.2	10	49.6	-2.6
Helvetia.....	Randolph.....	52.2	10	49.6	-2.6

* From the "Bulletin of the New England Meteorological Society."

The following notes, in connection with this subject, are furnished by voluntary observers:

Illinois.—Mattoon, Coles county: the highest October temperature during the past six years, 93° 0, occurred in 1883; the lowest, 26° 0, in 1880.

Riley, McHenry county: during the past twenty-six years the warmest October occurred in 1879, mean temperature, 56° 3; the coldest, in 1869, mean temperature, 38° 2.

Sycamore, De Kalb county: during the past six years the warmest October occurred in 1882, mean temperature, 56° 6; the coldest in 1885, mean temperature, 44° 8.

Indiana.—Logansport, Cass county: temperature comparisons for October

during the past thirty-one years: highest monthly mean, 59°.2, in 1884; lowest monthly mean, 42°.5, in 1869; highest maximum, 92°.0, in 1879; lowest minimum, 12°.0, in 1869.

Vevay, Switzerland county: the highest October temperature during the past twenty-one years, 96°.0, occurred in 1865; the lowest, 21°.0, in 1869.

Iowa.—Monticello, Jones county: during the past thirty-three years the warmest October occurred in 1879, mean temperature, 58°.0; the maximum temperature in that time, 88°.0, occurred in 1882; the minimum, 15°.0, in 1859.

Maine.—Cornish, York county: during the past twenty-nine years the warmest October occurred in 1879, mean temperature, 52°.6; the coldest in 1864, mean, 40°.9.

Maryland.—Fallston, Harford county: in the past sixteen years the highest October mean temperature, 62°.2, occurred in 1879; the lowest mean, 48°.5, in 1876.

New York.—North Volney, Oswego county: in the past nineteen years the highest October mean temperature, 55°.5, occurred in 1879; the lowest during the same time, 44°.7 occurred in 1876.

Palermo, Oswego county: in the past thirty-three years the highest October mean temperature, 53°.9, occurred in 1879; the lowest mean, 39°.3, in 1873.

Ohio.—Westerville, Franklin county: temperature comparisons for October during the past twelve years: highest mean temperature, 57°.7, in 1880; lowest mean, 46°.1, in 1876; highest temperature, 85°.5, in 1884; lowest temperature, 17°.5, in 1879.

Wauseon, Fulton county: the highest October mean temperature during the past sixteen years, 59°.0, occurred in 1879; the lowest mean, 46°.0, in 1875; the highest temperature, 87°.7, occurred in 1884; the lowest, 12°.0, in 1874.

Texas.—New Ulm, Austin county: during the past fifteen years the warmest October occurred in 1881, mean temperature, 73°.9; the coldest in 1873, mean, 65°.8; the highest October temperature during that time, 99°.0, occurred in 1877; the lowest, 36°.0, in 1873.

Vermont.—Strafford, Orange county: the highest October mean temperature during the past twelve years, 52°.8, occurred in 1879; the lowest, 43°.7, in 1875.

Virginia.—Dale Enterprise, Rockingham county: during the past six years the warmest October occurred in 1883, mean temperature, 64°.7; the coldest in 1880, mean, 52°.6.

Variety Mills, Nelson county: during the past nine years the highest October mean temperature, 61°.9, occurred in 1881; the lowest mean, 52°.0, in 1885.

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily, ranges of temperature, are given in the table of miscellaneous meteorological data.

The following are some of the greatest and least monthly ranges at Signal Service stations:

Greatest.		Least.	
Moorhead, Minnesota.....	72.8	Tatoosh Island, Washington Ter.....	19.8
Poplar River, Montana.....	70.7	Fort Canby, Washington Ter.....	22.2
Omaha, Nebraska.....	69.3	Key West, Florida.....	22.8
Fort Yates, Dakota.....	68.4	Astoria, Oregon.....	27.0
Saint Vincent, Minnesota.....	66.7	San Diego, California.....	28.4
Huron, Dakota.....	65.2	Port Angeles, Washington Ter.....	29.4
Fort Klamath, Oregon.....	63.0	Sanford, Florida.....	29.8
Yankton, Dakota.....	62.7	Hatteras, North Carolina.....	30.6
Fort Buford, Dakota.....	62.7	Cape Henry, Virginia.....	31.7

FROSTS.

The killing frosts that occurred on the mornings of the 2d and 3d were especially disastrous to the tobacco crop in Maryland, Virginia, North Carolina, Tennessee, and Kentucky, the loss in these states is placed at one fifth of the value of the crop.

The following reports from observers relate to these frosts:

Lynchburg, Virginia: the first frost of the season occurred on the morning of the 2d; in the immediate vicinity of this station it was light and did little damage, but in other portions of the surrounding country the damage done to the tobacco crop was great. Reports from Danville state that one-third of the lowland tobacco crop was injured.

Asheville, Buncombe county, North Carolina: the first frost of the season occurred on the morning of the 2d. It was heavy and injured vegetation, particularly the tobacco crop, to a considerable extent.

Reidsville, Rockingham county, North Carolina: the uncut tobacco, about one-half of the crop, was damaged on the mornings of the 2d and 3d by heavy frosts.

Louisville, Kentucky: on the morning of the 2d killing frosts occurred in the lowlands in every part of the state, about half

of the tobacco crop which still remained in the fields uncut was much impaired in quality from the effects of the frost.

Nashville, Tennessee: reports from the principal tobacco-growing counties of the state say that the frost of the morning of the 2d reduced the quality of the outstanding crop from thirty to thirty-five per cent.

Altamahaw, Alamance county, North Carolina: the first frost of the season occurred on the morning of the 3d, doing considerable damage to the tobacco crop.

Frosts also formed in the various states and territories during the month, as follows:

Alabama.—Montgomery and Mobile, 28th, 29th; Livingston and Greensborough, 28th to 31st.

Arizona.—3d, 4th, 8th, 12th, 13th, 14th, 19th to 25th, 28th, 29th, 30th.

Arkansas.—Fort Smith, 27th, 28th, 29th; Lead Hill, 27th, 28th, 30th; Little Rock, 27th to 30th.

California.—Princeton, 3d, 4th; Fort Bidwell, 6th, 12th, 20th, 31st; Nicolaus, 9th, 10th; Sacramento, 9th to 13th, 16th, 19th to 22d, 26th; Hydesville, 10th, 11th, 12th, 31st; Keeler, 11th; Los Angeles, 11th, 12th, 20th, 22d to 25th; Poway, 13th.

Colorado.—6th, 7th, 8th, 10th, 12th to 15th, 17th, 18th, 20th to 31st.

Connecticut.—1st to 5th, 7th, 17th, 22d, 23d, 24th.

Dakota.—1st, 2d, 12th, 15th, 16th, 17th, 20th, 21st, 24th to 30th.

District of Columbia.—2d, 3d, 17th, 22d.

Florida.—Pensacola and Tallahassee, 28th, 29th; Jacksonville and Archer, 29th, 30th, 31st.

Georgia.—Savannah, 28th, 30th, 31st; Atlanta, 28th, 29th, 30th; Augusta, Milledgeville, and Forsyth, 28th to 31st; Quitman, 29th, 30th, 31st.

Idaho.—6th, 9th, 13th, 17th to 22d, 24th, 25th, 26th, 31st.

Illinois.—1st, 2d, 3d, 13th, 15th, 16th, 21st, 22d, 27th to 31st.

Indiana.—1st to 4th, 16th, 17th, 22d, 23d, 30th, 31st.

Indian Territory.—Fort Reno, 24th to 28th; Fort Sill, 27th; Fort Supply, 26th, 27th.

Iowa.—1st, 2d, 4th, 15th, 16th, 21st, 22d, 25th to 30th.

Kansas.—1st, 2d, 15th, 21st, 23d, 25th to 29th.

Kentucky.—Bowling Green, 1st; Frankfort, 2d, 3d, 4th, 16th, 22d, 23d, 30th; Richmond, 2d, 3d, 16th, 30th; Louisville, 2d, 30th, 31st.

Louisiana.—Liberty Hill, 2d, 17th, 28th.

Maine.—3d, 4th, 17th, 19th, 20th, 22d, 23d, 24th, 27th.

Maryland.—2d, 3d, 17th.

Massachusetts.—1st to 7th, 16th to 20th, 22d, 24th, 25th.

Michigan.—1st to 6th, 15th to 18th, 21st, 23d, 25th to 31st.

Minnesota.—1st, 2d, 12th, 15th to 18th, 21st, 24th to 30th.

Mississippi.—Vicksburg, 3d, 28th, 29th, 30th.

Missouri.—1st, 2d, 5th, 21st, 27th to 30th.

Montana.—1st, 2d, 3d, 10th, 11th, 12th, 14th to 17th, 19th, 22d, 24th to 28th, 30th, 31st.

Nebraska.—1st, 2d, 13th to 21st, 23d to 31st.

Nevada.—1st to 6th, 9th to 28th, 30th, 31st.

New Hampshire.—2d to 6th, 8th, 17th, 19th to 22d, 24th, 25th.

New Jersey.—2d, 3d, 4th, 17th, 22d, 24th.

New Mexico.—Fort Stanton, 1st, 2d, 14th, 15th, 24th, 28th, 29th, 30th; Gallinas Spring, 1st, 4th, 29th; Santa Fé, 13th, 22d, 25th, 27th; Lava, 15th, 30th.

New York.—2d, 3d, 4th, 7th, 16th to 19th, 22d, 23d, 24th.

North Carolina.—Reidsville, 1st to 5th, 8th, 11th, 16th, 21st, 22d, 24th, 29th, 31st; Statesville, 2d, 3d, 4th; Lenoir, 2d, 11th; Flat Rock, 3d, 4th; Weldon and Raleigh, 3d, 29th; Charlotte, 28th to 31st; Chapel Hill, 29th, 30th; Wash Woods, 30th, 31st.

Ohio.—1st to 4th, 15th, 16th, 17th, 19th, 22d, 23d, 28th to 31st.

Oregon.—2d to 7th, 10th to 13th, 17th to 31st.

Pennsylvania.—1st to 8th, 16th, 17th, 19th, 22d to 25th, 29th, 31st.

Rhode Island.—2d.

South Carolina.—Spartanburg, 3d, 4th, 27th, 28th, 30th, 31st; Paolet, 3d, 28th to 29th, 30th; Stateburg, 28th, 29th, 30th.

Tennessee.—Milan, 2d, 3d, 4th, 16th, 28th to 30th; Memphis, 2d, 3d, 27th to 31st; Nashville, 2d, 16th, 22d, 28th, 30th, 31st; Chattanooga, 28th to 31st; Knoxville, 30th, 31st.

Texas.—Cleburne, 1st, 27th; Silver Falls, 16th; Fort Elliott, 26th, 27th; Corsicana, 27th; Palestine, 27th, 28th, 29th.

Utah.—11th, 12th, 13th, 19th, 20th, 23d, 24th, 25th.

Vermont.—2d to 9th, 16th, 17th, 19th, 20th, 22d, 24th.

Virginia.—1st to 6th, 11th, 22d, 23d, 27th, 29th, 30th.

Washington Territory.—9th to 12th, 20th to 26th, 29th, 31st.

West Virginia.—1st to 5th, 16th, 17th, 19th, 22d, 23d, 30th, 31st.

Wisconsin.—1st to 5th, 15th to 21st, 26th to 31st.

Wyoming.—26th.

ICE.

The formation of ice in the southern parts of the country occurred on the following dates:

Arkansas.—Lead Hill, 28th, 31st.

California.—Salinas, 31st.

Kansas.—Manhattan, 1st, 27th; Salina, 25th.

Maryland.—Fallston, 17th.

Missouri.—Oregon, 1st.

North Carolina.—Reidsville, 2d.

Texas.—Silver Falls, 1st.

TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water observed at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air:

Temperature of water for October, 1886.

Station.	Temperature at bottom.		Range.	Average depth, feet and tenths.	Mean temperature of the air at station.
	Max.	Min.			
Alpena, Michigan.....	57.1	45.3	11.8	11.7	48.1
Augusta, Georgia.....	77.0	59.5	17.5	5.7	61.7
Baltimore, Maryland.....	71.5	59.6	11.9	11.5	58.6
Block Island, Rhode Island.....	62.7	55.0	7.7	8.9	54.8
Boston, Massachusetts.....	56.1	49.2	6.9	23.5	51.5
Buffalo, New York.....	61.9	52.5	9.4	13.9	52.0
Canby Fort, Washington Territory.....	57.9	50.6	7.3	14.2	52.4
Cedar Keys, Florida.....	80.8	67.7	13.1	7.6	71.2
Charleston, South Carolina.....	79.4	64.9	14.5	37.6	66.5
Chicago, Illinois.....	60.4	47.3	13.1	8.4	56.6
Chincoteague, Virginia.....	73.6	58.0	15.6	3.9	61.0
Cleveland, Ohio.....	66.8	52.8	14.0	13.5	53.9
Detroit, Michigan.....	61.5	48.7	12.8	27.7	54.8
Duluth, Minnesota.....	48.7	42.1	6.6	10.5	46.9
Escanaba, Michigan.....	53.6	49.0	4.6	18.9	48.2
Galveston, Texas.....	77.3	65.6	11.7	15.2	71.6
Grand Haven, Michigan.....	63.0	48.7	14.3	18.4	52.3
Jacksonville, Florida.....	83.7	68.0	15.7	18.0	68.9
Key West, Florida.....	84.7	74.7	10.0	18.7	78.3
Mackinaw City, Michigan.....	56.8	49.0	7.8	10.0	50.3
Macon, Fort, North Carolina.....	78.3	65.6	12.7	14.2	64.8
Marquette, Michigan.....	57.7	47.1	10.6	12.0	50.3
Mobile, Alabama.....	80.0	69.0	11.0	17.1	64.7
New London, Connecticut.....	64.6	56.3	8.3	12.8	53.4
New York City.....	68.8	57.2	11.6	15.1	56.5
Norfolk, Virginia.....	73.7	60.3	13.4	16.6	61.3
Pensacola, Florida.....	76.3	66.2	10.1	17.9	69.0
Portland, Maine.....	55.9	47.5	8.4	17.5	47.9
Portland, Oregon.....	60.8	47.9	12.9	48.8	51.4
Sandusky, Ohio.....	63.0	49.1	13.9	10.3	54.0
Sandy Hook, New Jersey*.....	68.2	58.0	10.2	13.3	57.4
San Francisco, California.....	58.3	55.9	2.4	38.8	57.1
Savannah, Georgia.....	78.7	63.1	15.6	17.0	60.2
Smithville, North Carolina.....	79.2	65.0	14.2	10.4	63.5
Toledo, Ohio.....	65.2	48.7	16.5	12.9	53.4
Wilmington, North Carolina.....					

* Record for first 21 days of month.

† Observations temporarily suspended.

PRECIPITATION.

[Expressed in inches and hundredths.]

The distribution of rainfall over the United States and Canada for October, 1886, as determined from the reports of about seven hundred stations, is exhibited on chart iii.

Owing to the unusually small amount of precipitation dur-

ing the month, a shading to represent from one to two inches is used; usually, areas of less than two inches of precipitation are not shaded.

The precipitation of the month is largely below the normal in nearly every district of the United States, the only exceptions being the northern and middle portions of the Rocky Mountain region, the middle Pacific coast, northern Texas, and the western portion of the Indian Territory; in these districts the rainfall of the month is considerably above the normal. In Arizona and along the southern Pacific coast it is about normal, or only slightly above. Although the whole of the Mississippi Valley and all the country lying to the eastward is largely below the normal the greatest departures occur in the south Atlantic states, Gulf States, and Ohio Valley; within this large area one station only, Sanford, Florida, reports an excess of rainfall. The normal rainfall of the south Atlantic states for October, as deduced from the Signal Service observations of the past thirteen years, is 4.30, while the average for these states during October, 1886, is only .69, less than one-sixth of the normal; in the eastern Gulf states the deficiency is even greater; the normal for these states is 3.30, while the average of the Signal Service records of the present month within this area is only .36, about one-ninth of the normal quantity. The only stations east of the one-hundredth meridian at which an excess of rain fell are, Dubuque, Iowa, excess .95; Mackinaw City, Michigan, .22; Portland, Maine, 3.09; New York City, .58; Sandy Hook, New Jersey, 3.30; Atlantic City, New Jersey, 5.34; Sanford, Florida, 2.46.

The following are some of the most marked departures from the normal precipitation at Signal Service stations:

Above normal.		Below normal.	
Inches.		Inches.	
Atlantic City, New Jersey.....	5.34	Hatteras, North Carolina.....	6.01
Fort Sill, Indian Territory.....	4.73	Charleston, South Carolina.....	4.89
Sandy Hook, New Jersey.....	3.30	Brownsville, Texas.....	4.50
Portland, Maine.....	3.09	Smithville, North Carolina.....	4.29
Sanford, Florida.....	2.46	Springfield, Illinois.....	3.80
Winnemucca, Nevada.....	1.17	Pensacola, Florida.....	3.76
Yuma, Arizona.....	1.07	Jacksonville, Florida.....	3.76
Dubuque, Iowa.....	0.95	Wilmington, North Carolina.....	3.61
Fort Thomas, Arizona.....	0.82	Galveston, Texas.....	3.58
Fort Custer, Montana.....	0.75	Mobile, Alabama.....	3.53

In the following table are shown, for the several geographical districts, the normal precipitation for October; the average for October, 1886, and the excess or deficiency as compared with the normal:

Average precipitation for October.

Districts.	Average for Oct., Signal-Service observations.		Comparison of Oct., 1886, with the average for several years.
	For several years.	For 1886.	
	Inches.	Inches.	Inches.
New England.....	4.23	3.88	— 0.35
Middle Atlantic States.....	3.25	2.78	— 0.47
South Atlantic States.....	4.30	0.69	— 3.61
Florida Peninsula.....	5.42	4.27	— 1.15
Eastern Gulf States.....	3.30	0.36	— 2.94
Western Gulf States.....	3.73	1.44	— 2.29
Rio Grande Valley.....	3.71	0.34	— 3.37
Tennessee.....	3.35	0.81	— 2.54
Ohio Valley.....	3.20	0.88	— 2.32
Lower lake region.....	3.37	1.52	— 1.85
Upper lake region.....	3.56	2.23	— 1.33
Extreme northwest.....	1.85	1.46	— 0.39
Upper Mississippi Valley.....	3.38	1.70	— 1.68
Missouri Valley.....	2.58	1.18	— 1.40
Northern slope.....	1.09	0.84	— 0.25
Middle slope.....	1.44	1.11	— 0.33
Southern slope.....	2.26	3.90	+ 1.64
Southern plateau.....	0.76	0.77	+ 0.01
Middle plateau.....	1.13	1.65	+ 0.52
North Pacific coast region.....	4.19	3.48	— 0.71
Middle Pacific coast region.....	1.14	1.31	+ 0.17
South Pacific coast region.....	0.36	0.39	+ 0.03

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows, for certain stations, as reported by voluntary observers, the average precipitation for the month